ANTIMICROBIAL ACTIVITY OF ANGOLAN PLANT PHENOLIC EXTRACTS SENSORY IMPLICATIONS IN REDUCED NITRITE GOAT-CURED SAUSAGE

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I. INTRODUCTION

The meat products industry has, among its main challenges, the minimization of microbial spoilage and the control of biological hazards. Dry-cured fermented meat products are usually safe due to their reduced water activity and the protective effect of fermentative bacteria. This technology is of utmost interest to be used in regions with low levels of industrialisation of meat products processing, but it is mandatory to guarantee that biological hazards are effectively controlled. [1]. Natural products usually used in seasoning meat products have phenolic compounds that can contribute to the control of undesirable microorganisms [2].
The aim of this work was (1) to evaluate the antimicrobial activity of phenolic extracts from three Angolan plants (ginger, mukua, *gindungo*) against Salmonella, Listeria monocytogenes and Staphylococcus aureus and fermentative lactic acid bacteria (LAB) and coagulase-negative Staphylococcus (CNS) and (2) to evaluate the sensory implication of these vegetables on the sensory characteristics of a goat cured sausage.

II. MATERIALS AND METHODS

Ginger (*Zingiber officinal*), *Mukua* (*Andasonia digita*l), and *gindungo* (*Capsicum frutescens*) were obtained in Angola's Cuanza Sul province. The vegetables were dried at 40ºC, ground and sieved (10 mesh). The extraction of phenolics was performed with ethanol:water (50:50) using 3.33% of dried vegetable in the solvent, heated at 50ºC for one hour, and the extract was dried. Total phenolic compounds were assessed according to Weerakkody *et al*. [3].
Microorganisms were previously isolated from the meat products industry ecosystem (Table 1). Reference strains from American Type Culture Collection (ATCC) were also included for each species. The antimicrobial activity was performed by the disk diffusion assay (DDA) and minimum inhibitory concentration (MIC) by the dilution in wells, as previously described [4]. The experiment was made in triplicate. Dry cured sausages were prepared with traditional goat meat, pork fat, 1.5% salt, 7.5% red wine, 1% *mukua,* and 0.5% of garlic. (1%), ginger (0.5%) and 0.03% gindungo and 60 mg/kg sodium nitrite. The sausages were slightly smoked (20 min) and dried (15ºC, 85%, 2 weeks). The sausages were evaluated by three focus groups (8-12 participants). Means and standard deviation were calculated from the three replications.

III. RESULTS AND DISCUSSION

The total phenolic compounds extracted were (expressed in mg GA/100g DW) 90,86 ± 9,02 for mukua, 11.50±0.10 for ginger, and 31,60 ± 4,71 for *gindungo*. The antimicrobial activity of the extract is presented in Table 1. It is possible to observe that all the extracts had an inhibitory effect on *Salmonella*, *L. monocytogenes* and *S. aureus*. Still not aimed, these phenolic compounds also inhibit fermentative bacteria, which can be a problem once it might disturb the microbial equilibrium of the product. Taking into consideration the concern that these three pathogens represent, particularly *L. monocytogenes* and *S. aureus* due to their ability to grow in low aw products, and *Salmonella* due to

its low infective dose, the use of natural strategies based on natural products, to control it, particularly for regions where the technological level of the industry is limited, might be an attractive solution to improve the safety of meat products.

Table 1. Diameter (mean ± standard deviation) of inhibition halos (mm) and MIC

Microorganisms	Mukua		Ginger		Gindungo	
	DDA	MIC	DDA	MIC	DDA	MIC
Salmonella spp ATCC 49214	3.66±1.15	1200(1)	2.33±0.57	> 350	3.66±1.15	500
Salmonella SCh_M75(1)	2.33±0.57	1200	2.00±0.00	175	1.33±1.15	250
L. monocytogenes ATCC 35152	2.66±2.08	300	0.66±1,15	350	1.33±1.52	1000
L. monocytogenes LCh_M94(1)	0.66±1.15	300	1.66±2.08	175	0.66±1.15	500
S. aureus ATCC 25923	2.33±0.57	1200	0	> 350	1.33±0.57	1000
S. aureus SA_Ch_L05(1)	2.33±0.57	1200	0.66±1.15	350	0.66±1.15	>1000
L. sakei L_IIa_4(1)	3.33±2.88	1200	0	> 350	0.88±1.44	>1000
L. plantarum L_IV_5(1)	1.33±2.30	150	1.00±1.73	350	1.33±0.57	>1000
S. xylosus M_XI_1(1)	3.66±3.78	300	0.33±0.57	350	1.00±0.00	>1000

(1) expressed in µg of TPC/ml

The *mukua*, ginger and *gindungo* were tested for seasoning goat-cured sausage and analyzed using three focus group interviews. Generally, the products were very well accepted. *Mukua* was not noted sensorially by most of the participants. Punctually, they indicated pleasant aromatic herbal notes. Ginger imparts an unmistakable aroma to the sausages recognized as ginger or citric. The piquant of ginger was not distinguished from the piquant of *gindungo*. All the participants detected the intensity of piquant and was related to their consumption habits of spicy foods.

IV. CONCLUSION

The use of *mukua* extracts in preparing dry-cured sausages seems promising once it has an intense antimicrobial activity against pathogens and is almost undetectable sensorially. Ginger is also very attractive from the antimicrobial action point of view but is clearly noted by the consumer, and it is necessary to assess if these aromatic notes are robustly accepted in these products, that in our gastronomy are usually not present.
The use of *gindungo* is very limited. Still interesting in controlling pathogens, the sensory piquant limits its use and is depreciated by many consumers.

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